❖ *Names and Predicates: Translation and Semantics* ❖

5.2. Names and Predicates: English Language, Formal Language

1. Names and Predicates. As formal counterparts to proper names we add the capital letters A through F to the formal language. These are **name letters**. (As always, we permit adding numerical subscripts if a translation requires a large number of distinct letters.)

> **Name letters**: capital letters A through F (with or without numerical subscripts)

Translation tables are likewise expanded, assigning a name letter to each proper name in the argument – as in the following example.

> **A**: Aristotle
> **B**: Plato
> **P**: Learning is a form of remembering.
> **Q**: The unexamined life is worth living.

Of course names on their own will prove quite useless in providing new sentences, since trying to combine them with atomic sentences yields gibberish in both English and Formalese.

☠ Some Gibberish ☠

> ***Either the unexamined life is worth living, or Aristotle***: **(Q ∨ A)**

To yield new sentences we need to combine names with **predicates**. An English sentence uses the name "Aristotle" by way of attributing some *feature* to Aristotle.

> Aristotle **is Greek**.
> Aristotle **is a philosopher**.

To achieve this end in the formal language, capital letters **G** through **O** act as formal counterparts to English language predicates. These are **predicate letters**.

> **Predicate letters**: capital letters **G** through **O** (with or without numerical subscripts)

Just as proper name "Aristotle" and predicate "is a philosopher" combine to form a complete sentence in English, name letter and predicate letter do so in the formal language. (A minor notational difference is that while in English the proper name typically *precedes* the predicate, as a matter of logical tradition the name letter *follows* the predicate letter.)

Using the following translation table, we translate both our earlier English examples.

> **A**: Aristotle
> **B**: Plato
> **G**: ____ is Greek
> **H**: ____ is a philosopher

Aristotle is Greek	**GA**
Aristotle is a philosopher	**HA**

Predicate-letter-plus-name-letter thus forms a new type of atomic sentence in the formal language.

This expanded formal language marks an important change in sentence construction: while in previous chapters the smallest building block was itself a sentence – a sentence letter – with predicate and name letters we now cut finer than a sentence. Nonetheless it is whole sentences which are candidates for truth or falsehood, and in that sense even a predicate-letter-plus-name-letter counts as atomic: neither a predicate nor a name can be true or false on its own.

Revised construction rules for the formal language reflect this new type of atomic sentence.

Revised Construction Rules (*First Draft*)

Atomic Sentences:

A1. Sentence letters are atomic sentence

A2. A predicate letter followed by a name letter is an atomic sentence.

Formal Sentences:

1. Atomic sentences are formal sentences.

2. If ● is a formal sentence, then ~● is a formal sentence.

3. If ● and ▲ are formal sentences, then (● ∧ ▲) is a formal sentence.

4. If ● and ▲ are formal sentences, then (● ∨ ▲) is a formal sentence.

5. If ● and ▲ are formal sentences, then (● → ▲) is a formal sentence.

6. If ● and ▲ are formal sentences, then (● ↔ ▲) is a formal sentence.

Note that the only change we've made to the formal language so far is to add another type of atomic sentence.

2. Translation. Since a predicate-letter-plus-name-letter is an atomic sentence, just like a sentence letter, it can appear in all the same larger combinations: negations, conjunctions, disjunctions, and conditionals.

A: Aristotle	**G**: ____ is Greek
B: Plato	**H**: ____ is a philosopher
C: Gilligan	**I**: _____ is happy

Plato is Greek **and** Aristotle is Greek
("**Both** Plato **and** Aristotle were Greek"):

(GB ∧ GA)

Either Plato is a philosopher, **or** Gilligan is a philosopher
("**Either** Plato **or** Gilligan is a philosopher";
"**Either** Plato is a philosopher, **or** Gilligan is"):

(HB ∨ HC)

If Gilligan is happy, **then** Aristotle is **un**happy

(IC → ~IA)

Some of the peculiarities of English are familiar from previous chapters – e.g., deleting repetition ("Either Plato ~~is a philosopher~~ or Gilligan is a philosopher") and negation morphemes ("**un**happy"). But some are new.

For instance, when applying more than one predicate to the same name[1], English lets us conjoin these predicates by listing them in a row, one after the other. So the claim "Plato is a Greek philosopher" means the same as "Plato is Greek and Plato is a philosopher"; and both are translated into the same formal sentence.

Plato is Greek and Plato is a philosopher **(GB ∧ HB)**
Plato is a Greek philosopher **(GB ∧ HB)**

[1] As we will see in "5.4. Quantifiers and Variables", the easy equivalence between 'stacked up' English predicates and conjunctions holds when the subject of the sentence is a proper name, but breaks down in the case of quantifiers.

Likewise with larger conjunctions: “Plato is a happy Greek philosopher” translates the same as “Plato is happy and Plato is Greek and Plato is a philosopher”.

These ‘stacked up’ predicates can appear as parts of larger molecular sentences.

> If Plato is a Greek philosopher, then Plato is happy
>
> $$((GB \wedge HB) \rightarrow IB)$$

> If Plato is Greek, then Plato is a happy philosopher
>
> $$(GB \rightarrow (IB \wedge HB))$$

As we will see, translating stacks of predicates as conjunctions yields the correct results concerning truth and validity.

Already in Chapter Three we remarked that the **order of parts of a conjunction** makes no difference to the **truth** of the sentence.[2] So our treatment of ‘stacked up’ predicates suggests that switching the order of predicates in the stack’ should not affect the claim being made (or its truth value). Examples bear this out: the following two sentences are true in the same situations, and seem to say the same thing.

A: Plato	**G**: ____ is Greek **H**: ____ is male

Plato is a Greek male.	$(GA \wedge HA)$
Plato is a male Greek.	$(HA \wedge GA)$

[2] This is the **commutativity** of conjunction, discussed in “3.5. Inversion: An English Curiosity”.

It is peculiarity of English that predicates sometimes cannot naturally switch places in a sentence – as in the next examples.

> Newton is an English scientist.
> ☠ Newton is a scientist English. ☠

One solution here is instead to embed the second predicate, "is English," inside a relative clause.

> Newton is a scientist [who is English].

In so doing we again treat the original 'stack' of predicates as a conjunction – recalling from Chapter Three that a sentence with a relative clause is treated as a conjunction in disguise.[3]

Relative clauses also illustrate how English allows the second predicate to be moved forward in the sentence, by rephrasing that predicate.

A: Buck	**G**: ____ is a dog
B: Jake	**H**: ____ plays the banjo ("banjo-playing")
	I: ____ is a cowboy
	J: ____ counts cards ("card-counting")

Buck is a dog **who plays the banjo**.	**(GA ∧ HA)**
Buck is a **banjo-playing** dog.	**(HA ∧ GA)**
Jake is a cowboy **who counts cards**.	**(IB ∧ JB)**
Jake is a **card-counting** cowboy.	**(JB ∧ IB)**

Likewise a predicate like "(is) card-counting" is, when standing alone, more naturally phrased as "is a card-counter".

B: Jake	**J**: ____ counts cards ("is a card-counter")

> Jake **is a card-counter**. **JB**

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[3] In "3.4. Translation Variations".

With such English variations in hand, we can easily explain the intuitive validity of the following argument.

A: Jake

G: ____ is a cowboy
H: ____ counts cards
("is card-counting," "is a card-counter")
I: ____ reads minds
("is mind-reading," "is a mind-reader")

1. Jake is a cowboy who either counts cards or reads minds.	$((GA \wedge (HA \vee IA))$
2. Jake isn't a mind-reader.	$\sim IA$
$\therefore$ Jake is a card-counting cowboy.	$\therefore\ (HA \wedge GA)$

That argument is valid in the same way that its Chapter Three counterpart is.

1. We're having cake, and either coffee or tea.	$((P \wedge (Q \vee R))$
2. We aren't having tea.	$\sim R$
$\therefore$ We're having coffee and cake.	$\therefore\ (Q \wedge P)$

As always, noting English translation variations allows us to capture as much English form as possible – thereby allowing us to recognize the validity or invalidity of more English language arguments.